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Following White House Pressure

NIH Cautiously Weighs Move Into Bio-Industrial Role

The National Institutes of Health is inching toward some involvement in the industrial biotechnology role that has long been urged upon it by the Reagan White House Science Office. But the movement is slow, reflecting the anxieties of both NIH management and its grantees about new competitors for a tight budget.

The most concrete step so far is an agreement to contribute $150,000 to the MIT Center on Biotechnology Process Engineering, one of 6 university-based centers that the National Science Foundation announced last month in the debut of its ambitious Engineering Research Centers Program. With NSF providing the MIT Center $2.2 million this year toward a 5-year total of perhaps $20 million, NIH is joining in as a very junior partner. But given the biomedical research community's jealous regard for the NIH bankroll, the award has symbolic value beyond the relatively minor amount.

NIH officials justify the MIT award with the argument that biotechnology processing has a big future in pharmaceutical research and manufacture, and therefore fits in with NIH's health-promotion role.

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House Votes Budget Freeze For NSF and Space Agency

The anti-deficit clamor intruded into the charmed territory of research last month when by huge votes, the usually friendly House denied modest increases in the budget authorizations for the National Science Foundation and the National Aeronautics and Space Administration.

In both cases, the bill-writing Science and Technology Committee was merely asking the House to go along with a Presidential design that allowed research some growth in an otherwise crimped civilian budget. The labyrinthine legislative process assures that the final decision, for the fiscal year that begins next October 1, will be preceded by many opportunities for a turnaround. But the 2 emphatic votes have sent a shock through science-policy circles, especially since they come from a Congress in which science and technology have been increasingly revered as keys to economic salvation.

The action on NSF, cutting out a $100-million increase above the current $1.5-billion budget, was anticipated, and the Chairman of the paternalistic Science and Technology Committee, Rep. Don Fuqua (D-Fla.), was backed, 407-4, on his amendment authorizing Congress, rather than the Administration, to reshuffle NSF's steady-state $1.5 billion for next year. That move reflects distrust of the Administration's preferences for

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In Brief

With a resolution introduced last week, Senator Lowell Weicker (R-Conn.) is pushing for the full 6500 grants that the last Congress voted to finance for NIH this year, rather than the 5000 that the Administration wants to fund. But so far the culprit of the cuts, OMB, says informally that it won't go higher than 5500. Meanwhile, the clock is running on the current fiscal year and NIH remains barred by the White House from exceeding the 5000 limit.

IBM Alumnus Eric Bloch, Director of NSF, is said to have joined in the chuckle over an official-looking but spurious April 1 "OD" (Office of the Director) memo, "Toward a More Professional Environment Within NSF," which decreed that "Men will wear jackets and ties at all times . . . . Neither 'nerd packs' nor lariat ties will be tolerated . . . . Women will wear business suits and avoid vogush or provocative styling . . . . Desks tops must reflect an 'in control' appearance." The memo, signed Erich Block, Director, reported the commissioning of "an appropriate NSF anthem or theme song. If satisfactory words and music are forthcoming, it is my fervent wish that all of us . . . could begin the day in a song of rededication to the further professionalism of this grand institution."

How do NASA and the Defense Department compare in space spending? This year it's $7.4 billion for NASA, $12.9 billion for DOD. In 1980, the respective figures were $5.2 billion and $3.8 billion.

. . . Housing, Student Cuts Cited in R&D Freeze

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carving up the NSF budget, particularly in regard to its sluggish spending pace on science-education programs and its ideologically convoluted views of what's worth supporting in the social sciences.

But the 369-36 rebuff on the proposed $7.888-billion NASA budget, which was the first big authorization bill to reach the floor this season, came as a surprise. It followed a floor debate dominated by the theme that science and technology are immensely important, but, the argument went, deficit cutting is even more important. The result was elimination of the $330-million increase proposed by the Administration and endorsed by Fuqua's Committee.

The cutback was called for in an amendment by Rep. Bruce A. Morrison (D-Conn.), who forcefully argued, "I do not believe that people in this House will support the kind of cuts in student loans, cuts in housing programs, cuts in mass transit assistance, cuts in agricultural programs and the like that would have to be made in order to find the funds to find the extra $330 million . . ."

Rep. Edward Boland (D-Mass.), Chairman of the NASA Appropriations Subcommittee, warned that "We are operating in a different atmosphere this year, and the . . . Subcommittee which I chair faces inequities among the agencies carried in our bill—including the fact that incremental units for HUD's (Housing and Urban Development) subsidized housing program was zeroed for fiscal years 1986 and 1987."

Proponents of the increase for NASA invoked the rhetoric that had proven magical in past debates over science-related issues. But this time, it didn't work. Prominent among them was Rep. Bob Walker (R-Pa.), a member of the Science and Technology Space Science and Applications Subcommittee.

The proposed increase works out to less than one percent when adjusted for inflation, Walker began, and, thus, amounts to little at all when balanced against NASA's contributions to the national economy. "The President of the United States, despite the fact that he understands that we have to do some-

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. . . *Wyngaarden Cites Opportunities for NIH-Industry Ties*

(Continued from page 1)

But anything new tends to perturb the Bethesda empire. On several occasions over the past 2 years, White House Science Adviser George A. Keyworth II publicly assailed NIH for what he termed its indifference to the Administration's stress on science for the sake of industry. His words didn't seem to stir NIH, until very recently.

Last October, for example, Keyworth told a Washington audience that "NIH is virtually prevented . . . by their own perception . . . from accepting any cooperative involvement with government, in training, in moving technology into industry, and in trying to direct some of the educational environment that we find in our universities into some parallelism with what the new bio-engineering and pharmaceutical industries require." (SGR Vol. XIV, No. 17.)

Other signs of NIH's movement toward industrial interests include 2 recent meetings between NIH Director James B. Wyngaarden and representatives of the Industrial Research Institute, which is the trade association of major research-performing firms. NIH and the biotechnolgy industry will also be the exclusive subject of the next meeting of Wyngaarden's own advisory committee, a blue-ribbon group, drawn from academe, industry, and medical practice, that meets twice-yearly to think aloud with the NIH Director, senior NIH officials, and officials of the advisory councils attached to each institute.

The meeting, scheduled for June 24-25 at NIH, is essentially a big, fairly informal bull session. The agenda hasn't been completed yet, but Wyngaarden told SGR last week that he plans to have several industrial executives spell out their views about possible relations between NIH and the biotechnology industry.

Testifying in March to the House Science and Technology Committee Task Force on Science Policy, Wyngaarden said that he expected that the June meeting of his advisory committee would "in all likelihood open up some new opportunities for cooperation with industry."

He added that NIH is looking into holding 2 "major scientific conferences" involving "industrial leaders." He noted, too, that the laboratories at the Bethesda campus are hosts for long-term working visits by foreign industrial scientists, but that few American firms place their staff members there. NIH, he said, is looking into ways for both American, as well as additional foreign industrial scientists, to work in the NIH intramural program for periods of up to a year.

. . . Loving Science While Restraining Growth

(Continued from page 2)

thing about the deficits that we face, also understands that we have to project into the future. We have to understand that by the year 2010 we are capable of generating a trillion-dollar new economy from outer space; that by the year 2050, we are capable of generating a $4.5-trillion economy in outer space.

"The only way we can do this," Walked continued, "is with a space station . . . . Now I understand that we have got a lot of Luddites around the Congress here who are perfectly willing to cancel out science and technology and are perfectly willing to move away from the space station." Walker went on that he, too, favored a budget freeze, "But I think we had better understand that we are going to have an impact on one of the great growth areas that the President himself had defined."

Walker then proposed an amendment that would freeze the budget at this year's level, but exclude commercial space activities from any cutbacks. The result, of course, would be a replay of the financial devastation that Space Shuttle overruns brought to NASA's scientific research programs, which was promptly pointed out by Rep. Dan Glickman (D-Kan.), Chairman of the Science and Technology Subcommittee on Transportation, Aviation, and Materials.

Walker's proposal, Glickman said, "takes all the cuts out of planetary sciences, astronomy, life sciences, and aeronautics and puts it all into commercial space development. That is really a ridiculous thing to do for the future of this country," he said, adding that he was uneasy about the amendment to freeze the NASA budget next year, "But we have got a crisis in America and the crisis is that we are bleeding to death because of high deficits, and if we do not start here, we will never start anywhere."

What do the NASA and NSF votes portend for research funding? The favorable sign at the moment is that the members are voting to freeze rather than cut, and that the votes against the small increases sought by the White House have generally been accompanied by expressions of sorrow, rather than hostility.

By and large, the Congress retains a naive faith in the economic potential of R&D. The Proxmire-style ridicule of science that previously guaranteed laughs on the floor and a pile of press attention are pretty much out of style. The votes represent a setback, but it's a setback related to special economic and political circumstances, rather than disenchantment with R&D.—DSG

R&D Funding at New Peak

National R&D spending—from government, industry, and all other sources—will reach a record $107.3 billion this year, according to the annual Battelle-Columbus R&D forecast.

That's $10.3 billion more than spending reported for 1984, and, after inflation, works out to a 3.9-percent increase, Battelle says.

The major sources of the 1985 spending are industry, $55 billion, up 11 percent from the previous year; the federal government, $48.7 billion, up 10 percent, and academic and other non-profit institutions, $3.6 billion.

Copies of the R&D report, "as long as the supply lasts," are available without charge from Battelle, Office of Corporate Communications, 505 King Ave., Columbus, Ohio 43201-2693.

PHS Sets Meeting on Violence

US Surgeon General C. Everett Koop has announced plans for a national Workshop on Violence and Public Health to be held October 27-29 in Leesburg, Va., near Washington, DC.

Co-sponsors within the Public Health Service (PHS) are the Alcohol, Drug Abuse and Mental Health Administration, the Division of Maternal and Child Health of the Health Resources Administration, and the Epidemiology of Violence Branch of the Centers for Disease Control.

Others are the Administration on Children, Youth, and Families and the Administration on Developmental Disabilities, both in the Department of Health and Human Services, and the Office of Juvenile Justice and Delinquency, in the Justice Department.

For additional information: Ted Cron, PHS, 202/245-3102.

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NAS Head Offers Fresh View on "Pork" Issue

The conflict over political pork-barreling for R&D facilities has long remained in a rut, with the nimble greedy asserting anything goes while their rule-watching competitors nervously warn of anarchy and insist that they can't long remain immobile.

But now, in contrast to the standard formula for dissolving the problem solely with federal money, Frank Press, President of the National Academy of Sciences, has suggested a new perspective on the role of peer review in distributing federal R&D construction funds, as well as some alternatives for seeking additional funds.

Press made his suggestions in a talk April 3 to the American Association for the Advancement of Science annual meeting on the federal R&D budget. The talk, delivered in Press's soporific speaking style, aroused little interest, on the spot or since then. But it merits notice as perhaps the first realistic formula for responding to an increasingly troublesome issue.

Attributing the outbreak of direct lobbying for building money to "desperation" arising from "a decade of undercapitalization of academic facilities," Press rejected the purist reverence for peer review as the decisive element in siting facilities. Politics, he pointed out, has always figured large in picking locations for major national facilities—but the process has included a role for scientific peer review.

"In funding large facilities, peer review narrows the list of candidates," he said. But, he continued, "The actual decisions emerge from a comprehensive merit review, incorporating political, geographic, economic, and other policy elements."

Those considerations prevailed in the siting of the Fermilab, for particle physics, in Batavia, Ill., in the mid-1960s, he noted, and they're to be expected in decisions concerning the next big accelerator, the Superconducting Super Collider, as well as other major facilities being planned.

What's needed now, he went on, is the same recognition of the "more limited but vital role" of peer review in the allocation of local and regional facilities—which have been the focus of Congressional end runs in behalf of constitutent universities (SGR Vol. XV, No. 4). "We need a common understanding," Press said, "that scientific evaluation is a necessary, but still only one, facet of deciding which facilities to support and at which institution. The amount of money involved in such institutions, and the implicit commitments needed to support their long-term operation makes political and other factors inescapable. What peer review can do is to assure that any facility finally selected merits its support in terms of the overall health of science. Such a review has been absent in the recent facility decisions made by [Congressional] floor amendment."

Turning to money, Press stated that the econonic and political climate precludes a sizable federal response to a building backlog reported at several billion dollars. As an alternative, he suggested, efforts should be made to leverage a modest federal startup fund of perhaps $100 million a year into purchasing power far beyond that sum. This might be done, he said, through matching programs from state and private sources, "fractional set asides" from research budgets, "lease-purchase plans chargeable to indirect costs," and local tax-exempt bonds "amortized by costs assigned to research budgets."

Finally, Press issued a warning about scientific debate and lobbying over money, suggesting, in effect, that scientists must avoid creating the impression that they regard science to be solely the business of scientists:

"We must help frame the debate so . . . national interests are raised and the promising scientific opportunities in virtually every discipline are understood by the public and its elected officials. If our own community preoccupies itself with shrill discussions of dollars or, through its actions, creates a perception of undue self-interest, the scientific enterprise will be seen as a claimant for funds and for special institutional support."

OMB's David Stockman might respond, yes, indeed, so you must. And he might also observe that, with the exception of the recommended state and private matching, Press's proposed financial measures add up to a roundabout billing of the federal government. They do, but even so, the debate over pork and peer review and R&D financing has been so arid for so long that Press's modest proposal represents progress.

House S&T Reports Available

Congress's busiest committee in the scientific and technological area, the House Science and Technology Committee, announces the availability of hearings and reports from its activities last year. These range over a wide variety of government agencies (including NSF, NASA, and the White House Science Office), as well as such subjects as supercomputers, science education, and international R&D cooperation.

For a list of the publications, which are available without charge: Publications Office, Committee on Science and Technology, US House of Representatives, Room H2-108, Annex 2, Washington, DC 20515; tel. 202/225-6275.

In Quotes: Insider's Look at R&D Policymaking

For an unsentimental, well-informed insider's account and analysis of federal R&D policymaking, no recent book comes up to the high performance of a newly published work by a veteran senior official of the National Science Foundation, Harvey A. Averch: **A Strategic Analysis of Science & Technology Policy.** *Published in January, it has so far gone virtually unnoticed, even in journals that should be shamed by that neglect.*

Averch merits attention not only for candor, but also because of where he's been and where he is now. An economist by training, he served as NSF's Assistant Director for Education from 1975-77 and as Assistant Director for Science, Technology and International Affairs from 1977-81. Since then, and until recently, he was on detached duty at the University of Maryland, Baltimore. At NSF he now holds the title of Senior Staff Associate and serves on the personal staff of NSF Director Erich Bloch. The following excerpts are from his book's concluding chapter.

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For most public policy choices, there now exists a cadre of analysts whose business it is to examine skeptically claims and arguments made by interested actors and constituencies . . . . [and] to bite the hand that feeds them, to "speak truth to power . . . "

No such cadre exists in S&T (science and technology) policy. Thus, reports, findings, claims, and proposals from strongly interested and probably biased parties are often taken to settle discussion and debate, not to begin them. For example, if science educators argue that all citizens must acquire science literacy, the argument is taken as self-evident, not as a signal to ask what it might mean, how it might be gotten, and what its relation might be to achieving other skills and values . . . .

Since decisionmakers can and do use criticism to cut budgets and treat science and technology unfavorably, criticism is often equated with disloyalty, as illustrating an intent to subvert the well-being of the enterprise and the high social values that it carries and transmits . . . . The S&T bureaucracies are so nakedly sensitive to downward budget fluctuations . . . that any desire for long-run strategic flexibility will usually be overcome by the very strong and immediate desire to preserve current budgets. Flexibility within smaller budgets will nearly always be considered inferior to rigidity within larger budgets . . . .

To many scientists and engineers, evaluation and analysis must always be qualitative and intuitive, a matter to be judged by those served, not analysts. Hard, tough evaluation and analysis, even if feasible, can only cause budgetary damage, insuring violation of the budget-maximization objective that holds for most S&T agencies. And, to most of the S&T community, lower budgets imply harm to the enterprise. Analysis is suppose to support the enterprise, not criticize it.

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Where there are strong conflicting values about an issue, and where there are conflicting specifications for a problem, policy prescriptions ought to be weak, not strong. Thus, calls for national industrial policies, revitalization policies, or innovation policies should be regarded skeptically. Given that value conflicts cannot be resolved and ignorance cannot be diminished in the short run, any government programs should be small-scale, experimental, and terminable. These are difficult design criteria to meet, since there will always be political and bureaucratic demands for expanding small or experimental programs to full coverage.

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The consequences of poor science education are predicted to be so bad that the need for more effort and resources is taken as self-evident . . . . The puzzle then is why science education programs fare so badly in the competition for attention and resources. Why does it take perceptions of crisis, of galloping mediocrity, to generate more resources for what is said to be so transparently evident? . . . .

Science education is said to be necessary for economic growth, productivity, and maintenance of comparative advantage. But one can observe that nations do grow and prosper without high levels of science education, by US standards . . . . Science education is also said to create literate citizens who can make good decisions, but a technically informed citizenry does not necessarily lead to sound or acceptable public decisions . . . . There is no limit to the skills that can be reasonably listed as having utilitarian properties and, therefore, no limit to the educational programs worthy of public resources.

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The politics of S&T bureaucracies resembles that of other bureaucracies, but it is focused on far fewer dimensions—mainly the level of budget and its rate of growth. Other bureaucracies can take pride in their efficiency or even their effectiveness in delivering goods and services to eligible clients . . . but such

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. . . Averch: Success Measured by Rising Budgets

(Continued from page 5)

success is small solace in S&T bureaucracies. In the main, their output is their input—dollars go in, they are redistributed according to standard operating procedures, and they come out on their way to members of the S&T community. Success means ever-increasing volumes of throughput . . . . The search for [policy and program] alternatives becomes focused on those that are acceptable to the cognizant bureaucracies.

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Bureaucratic politics and incentives are reinforced by the relations between the S&T community and the [government] science advisers and administrators. Most of the latter come from the community, and after a short time, they will be going back—they hope, of course, to better jobs than they left. On the outside, their success will be measured by the increases in budget or in the acceleration in growth rates in budget . . . They will definitely not be judged on the efficiency their organizations obtained or on the number of S&T programs they terminated, no matter how ineffective these may have been . . . .

From the perspective of the S&T community, federal S&T administrators are its representatives, in government on loan, to assure that no harm is done to its interests . . . . There is nothing unusual in such a situation . . . but because research and education contain higher-order social values, the S&T community believes that it is different in kind from dairy farmers or automobile manufacturers and that it deserves kind treatment and attention.

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Although science advisers and administrators frequently say they are not the representatives of the community but serve the president or other officials for whom they work, they cannot avoid speaking on behalf of the interests of the S&T community. They cannot avoid continually making a case for more budget in good times or bad without losing reputation and support from their short-run constituents inside the government and, more importantly for their future, from their long-run constituents in the research universities and other institutions connected with science and technology . . . . One can be reasonably certain that an R&D tail will wag any policy dog placed in the care of science advisers and administrators.

(A Strategic Analysis of Science & Technology Policy, by Harvey A. Averch, 216 pages, $20, Johns Hopkins University Press, 1985.)

In Print: Energy Manpower, Geosciences, Federal Labs . . .

Energy-Related Manpower, 1984, Department of Energy report focusing on scientists and engineers, who make up about 10 percent of the 3 million workers in energy fields; says energy R&D job demand in the 1980s is running behind standard projections, but in energy, as elsewhere, shortages exist in computer-related specialties; also forecasts lower demand for some PhDs from the shift from public to private funding of energy R&D; contains lots of data on enrolments, degree awards, R&D funding, plus employment forecasts in the various energy fields.

(89 pages, $11.50, National Technical Information Service, Springfield, Va. 22161.)

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Worldwide Directory of National Earth-Science Agencies and Major Related International Organizations, latest edition of US Geological Survey directory listing names, addresses, and officials of its counterpart agencies in more than 160 countries, plus international organizations in the earth sciences.

(102 pages, no charge, Branch of Distribution, USGS, 604 S. Pickett St., Alexandria, Va. 22304; tel. 703/860-6551.)

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Progress Report on Implementing the Recommendations of the White House Science Council's Federal Laboratory Review Panel, Volume I (Summary Report, 30 pages), Volume II (Status Report by Agencies, 61 pages), tells what's happened or in the works since 1983, when a White House Science Office study, chaired by Hewlett-Packard's David Packard, said federal labs should rethink their missions and staff sizes, cut loose from civil service rules, give more help to industry, and so on. The agency-by-agency reports indicate some progress toward the goals, but the labs, which absorb about one-third of the current $55-billion federal R&D budget, are, by their own accounts, not prone to swift change.

(Both volumes available without charge from the Of-

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Europe: Seeking to Emulate US High-Tech Boom

London. Envious looks at the American experience have embarked the countries of Western Europe on a quest to promote the development of small, technology-based industrial firms. The goal has become quite fashionable among politicians and planners, and the focus here, as in the US, is on making profits from scientific and technical ideas coming out of academic and government research centers, as well as existing industrial organizations.

These stirrings, which can be seen from Britain to West Germany and from Scandinavia to Italy, arise from fears that Europe is falling further and further behind the US and Japan in high-tech capabilities. The hope, then, is that a surge of science-based enterprise will invigorate the industrial atmosphere and add jobs to Europe's long-stagnant employment rolls. In addition, the longings for Old World counterparts to Silicon Valley and Route 128 are accompanied by the nagging worry that Europe just isn't getting value for money in return for the substantial sums it expends on research in universities, government establishments, and multi-national facilities.

These various factors are behind the recent rush of initiatives to make venture capital more easily accessible to scientists with the capitalist itch and to set up science parks and other facilities linked to university research establishments.

In West Germany alone, in the past year or so, about 40 municipalities have announced or built innovation centers to provide working space for fledgling technology-based firms. In most cases, these are linked either to a local academic institution or to a chamber of commerce, with the latter helping with a variety of services, from recruitment of specialists to scouting for financial assistance.

Spurred on by an enthusiastic federal Ministry of Research, banks in West Germany have been rushing to establish venture-capital divisions to put money into the new enterprises. According to the Ministry, the number of these financial organizations rose from just 1 in 1983 to 24 at the end of 1984.

Britain has led in the development of science parks. Three of them were built in the early 1970s, at Cambridge University, Heriot-Watt University and Cranfield Institute of Technology. Since 1980, another 10 have been built or are under construction, and others are planned. These science parks, typically next door to a university, have been initiated either by the university or the local government council. The basic aim is to link the presumed creativity of the academic departments with market-minded enterprises in the science parks. In some instances, the management of the parks pitch in with managerial and business help.

British financial institutions are at last showing an interest in these enterprises. Two major insurance companies have started organizations to back companies involved in new technologies. Barclays, one of Britain's biggest banks, is financing several science parks linked to universities.

Measures similar to these have been adopted in Sweden, the Netherlands, and France. The government of President Mitterrand—who was wowed by the Apple Computer story during a US visit last year—has just announced tax revisions designed to lure investors to high-tech startup companies. The European Economic Community (EEC), too, is designing and implementing a variety of measures to promote these kinds of companies, including grants to get science and innovation centers off the ground.

What have these measures achieved? The most widely held view is that it's too early for an assessment, since most of these initiatives began only in the past 3 years

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In Print

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fice of Science and Technology Policy, Executive Office of the President, Washington, DC 20506; tel. 202/395-3840.)

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The Department of Defense Report on The Technology Base and Support of University Research, prepared at the request of the House and Senate Armed Services Committees, which have taken up the plea from academic lobbyists for more Pentagon money for campus labs; says DOD feels it benefits from research and training in universities, that it spent about half of its $840-million basic research budget in academe in fiscal 1984 (including support of 4000 graduate students), and, Congress willing, plans to up the amount from $421 million this year to $465 million next year.

(83 pages, no charge, available from Research and Laboratory Management, 3E114, Pentagon, Washington, DC 20301; tel. 202/694-0205.)

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Academic Research Equipment in the Physical and Computer Sciences and Engineering, report of a study prepared under contract to NSF by Westat, a Washington-area consulting firm, says department heads in 43 surveyed universities claimed equipment shortages are interfering with research, and that they need money for new instruments, especially in the $10,000 to $1 million categories.

(130 pages, no charge, available from Division of Science Resources Studies, NSF, Washington, DC 20550.)

. . . Science Park Review Finds Progress Slow

(Continued from page 7)

and some of the most ambitious efforts are less than a year old. But even the strongest backers are cautioning that the results won't be dramatic. West Berlin's local-goverment minister for science, Wilhelm Kewenig, recently told an EEC conference on science parks that the main impact of current efforts may be the psychological boost they provide for those contemplating a plunge into high-tech entrepreneurship. The innovation centers, he said, "can change ideas and prejudices and trigger off developments."

Kewenig was speaking from the experience of West Berlin's own innovation center, which was begun about 18 months ago in an old factory building administered by the Technical University of Berlin. About 25 companies, with staffs totaling roughly 100, are in the center. The plan calls for approximately 35 more companies to set up shop there in the next few years. In addition, the center hopes to attract divisions of large companies that are drawn by the entrepreneurial atmosphere. There's some sign of that already, Kewenig reported, with Nixdorf, a big computer company, planning to build a production plant next to the innovation center.

One of the oldtimers in these procedures, Sweden's Chalmers University, in Gothenburg, reports promising results from a set of measures designed to promote the start of new companies by academics. These include seminars on startup techniques and assistance in obtaining financing. Over the past 20 years, 98 companies have been formed in this way, including 11 in 1984.

But some studies of these efforts to spur innovation have produced discouraging conclusions. Researchers at the Fraunhofer Institute, in Karlsruhe, looked at 150 companies founded since the mid-1960s by former employes of government research institutes. (Currently, 10-15 new companies a year in electronics and instrumentation are being formed in this way.) The Karlsruhe researchers concluded that the number of these enterprises was disappointingly small, given that the government employs some 30,000 scientists and engineers at the 15 scientific centers that were studied. One of the authors of the study, Dirk-Michael Harmsen, said he thought that 100-150 staff members per year ought to get fired up enough to try the private sector, and that their transition might be assisted by flexible working arrangements.

A British study, by Jean Currie, an economist, paints a generally gloomy picture of the results obtained from the UK's science parks. Of the 170 or so companies situated in these parks at the end of 1984, she reported, many complained of what they regarded as barriers between themselves and the academic authorities who claimed to want to help them. A common complaint, Currie said, was that contact with the academic researchers was routed through bureaucratic channels. Ironically, her findings also suggest that the proximity of academic science is useful for these young firms, but for non-scientific reasons. Rather, she said, the linkage with a respectable academic institution provides credibility when the firm tries to market its products.

America's hot spots of small-firm prosperity are often cited by admiring Europeans, but a point often raised by skeptics is that Europe is now trying to reproduce a remarkable industrial phenomenon that happened with little or no planning or central guidance. The main factors in the US experience appear to have been a cultural receptivity to entreprenuership plus a gigantic market for goods.

The difficulty of persuading European scientists that businesss is an honorable activity was discussed at the EEC conference by Robert Skidmore, a UK medical physicist who is a consultant to International Medical Dynamics, a small Edinburgh company that sells diagnostic ultra-sound scanners. Skidmore related that he became involved with the firm more or less by accident. "People in my environment have a career in science and it doesn't really warrant any detours into business. It's more important to do good scientific work and get it published. You don't gain kudos through commercial activities."

The politicians and planners are beginning to realize that attitude may be the greatest barrier to emulating America's success in growing small high-tech enterprises.—Peter Marsh

(The author is technology correspondent of the Financial Times, *of London.)*

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